PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 30861	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SI 03/00046	International filing date *(day/month/year)* 22.12.2003	Priority date *(day/month/year)* 24.12.2002
International Patent Classification (IPC) or both national classification and IPC G06K7/08		
Applicant KUNC, Vinko et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
20.07.2004	02.02.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Heusler, N Telephone No. +49 89 2399-2359

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/SI 03/00046

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

3-6	as originally filed
1, 2, 7	received on 08.12.2004 with letter of 06.12.2004

Claims, Numbers

1-3	received on 08.12.2004 with letter of 06.12.2004

Drawings, Sheets

1	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-3
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-3
Industrial applicability (IA)	Yes:	Claims	1-3
	No:	Claims	

2. Citations and explanations

   see separate sheet

The following documents are cited:

D1: US 6,122,331 cited by the Applicant
D2: US 5,721,552
D3: US 4,893,539
D4: Motorola data sheet MC 1490 RF/IF/Audio Amplifier (Rev. 5, published 1996, pages 1-8, cited by the Applicant)

Ad V.2 - novelty, inventive step; citations and explanations

1. The application **relates to** an amplifier AGC (automatic gain control) circuit in the receiver of RFID systems. The **problem** is to set the gain of the interrogator receiver (base station) automatically so that the level of the received signal is well within the linear region of the final amplification stages, regardless of the transponder's distance to the receiver.

   The **solution** is to control cycles of "attack" and "decay": Similar to the prior art, an "attack" (= decrease gain) is started if the input signal level is above a first threshold V_{ATT}. The improvement is that if the signal level remains below a second threshold V_W for a predetermined period of time, a "decay" (= slowly increase gain) is automatically ordered.

   Hence, essential characteristics of the input signal are not changed. As it can be seen in the Figure, the signal line U'_{out} for the three data wave packet a, b, c has nearly the same form, even though the three input signals U_{in} largely differ with respect to their intensity.

2. D1 discloses an automatic gain control circuit: time intervals when the input signal is close to zero ("preferred gain transition region") are selected as preferred regions for a gain-change of the signal, whereby the output signal is distorted to the lowest degree. If, however, the signal stays outside the preferred region for a predetermined time, the gain may also change. This method is used for continuous signals, in order to avoid the "clap" effect (i.e. the speaker produces an audible tone when the gain is changed).

   D1 deals with a method of determining an optimal time during which to change the gain (col. 2, lines 41-45). In col. 3, lines 34-38, D1 suggests to increase the gain (= decay) after a predetermined time without the input signal moving into the "preferred gain transition region". Fig. 4 of D1 shows that if the signal stays for a certain period of time (starting with line 65) below the lower margin of the "preferred gain transition region", then a decay is activated ("second criteria", col. 3, line 30). The lower margin of area 63 in Fig. 4 corresponds to the value V_W in the present claim.

   In other words, D1 suggests to "raise" the gain after the lapse of a waiting period (e.g. 0.1 seconds) which started when the instantaneous value of the amplified signal (Fig. 4, AGC_{out}) exceeded a waiting threshold (lower line of area 63) for the last time. This means that the feature in the characterizing part of **claim 1** is known from D1.

Whether or not the decay is activated "each time" after the output voltages exceeds its threshold is not relevant, since the claim wording does not contain a corresponding feature.

D1 does not mention that the AGC circuit is used for the claimed non-contacting identification system consisting of an interrogator and several transponders, so that the subject matter of **claim 1** meets the requirement of novelty (Art. 33 (2) PCT). The use of AGC is, however, well known in the art also in this field, for example from D2.

3. From D2 an electronic toll collection system with a beacon and a transponder (OBU) in a car is known. It suggests a two-stage AGC between the beacon and the OBU, thus eliminating influences caused by other vehicles on nearby lanes. D2 explicitly mentions that an AGC circuit should be used as a feature of interrogator/transponder-systems (col. 1, lines 4-6 and col. 2, lines 53-56).

   Consequently, it is obviously for a skilled person to implement the AGC technique of D1 with the transponder of D2. A combination of D1 and D2 leads to a method that falls under **claim 1**. Therefore the subject matter of this claim is not inventive (Art. 33 (3) PCT).

4. The advantage of the features added by **claims 2 and 3** is not clear, so that these claims do not appear to imply a technical contribution. Moreover, also in D1 the rate of the gain raising is of the same order of magnitude as the rate of the gain lowering. Hence, the requirement of inventive step is not met.

5. The terms "attack" and "decay" are also known from waveform generation circuits used for music and sound synthesizers (ADSR-waveform: attack, decay, sustain, release); D3 (see Fig. 9) is cited as an example. This concerns, however, a completely different technical field which would probably not be combined with any of D1 or D2. Moreover, the terms "attack" and "decay" are not used in the claims, so that D3 is not relevant for assessing of the inventive step.

Other observations:

Certain defects (form and content, Rules 5 - 7 PCT)

6. D2 is not **acknowledged** in the description (Rule 5.1a PCT).

7. The definition of the invention in the description (page 3, third paragraph) differs from the amended claims, contrary to Art. 6 junctim Rule 5.1a PCT.

8. The Figure appears to be incorrect, or at least appears to be in contradiction to claim 1. The signal line U_{att} shows one short peak in the beginning (data packet "a"), although the relevant signal U_{out} does not exceed the threshold V_{att}. The claim does not say that the absolute value

of U_{out} should exceed threshold V_{att} (which then may consist of two thresholds: one positive threshold $+V_{att}$, and a negative threshold $-V_{att}$). Also, such a feature is not originally disclosed (Art. 34 (2b) last sentence PCT). In accordance with claim 1, also the description (page 6, paragraph 3) only mentions a positive threshold V_{att}. Negative thresholds V_{att} and V_W are not mentioned anywhere in the application.

Clarity, conciseness, support by the description (Art. 6 PCT):

9. In **claim 1**, it is not clear which signal is meant or referred to by the term "amplified input signal" (line 5). The output signal of an amplifier is normally the one that is amplified, while the input signal is not yet amplified.

   Similarly, it is not clear whether the term "amplified signal" (**claim 1**, line 10) is the input signal or the output signal of the AGC amplifier.

10. The expression "instantaneous value" in **claim 1** is unclear.

Method for automatically setting the gain of an interrogator receiver within a non-contacting identification system

The present invention relates to an improvement of such method for automatically setting the gain of an interrogator receiver within a non-contacting identification system, which system consists of the interrogator and several transponders, that an attack in a receiver amplifier of the interrogator is activated each time when an amplified input signal exceeds an attack threshold voltage level, and a decay is activated after the attack has ended, the improvement being accomplished by means of considering at the characteristics of the communication between the interrogator and the transponders.

A non-contacting identification system consists of an interrogator generating radio frequency electromagnetic waves, and of one or several transponders, for which said electromagnetic waves represent an energy source. The transponders send data to the interrogator by transmitting appropriately modulated waves as received.

Variations, as produced by said modulation, in the level of the received signal are amplified in a receiver of the interrogator. In order to cover the largest possible communication space region, the receiver has the largest gain as allowed by the input noise level. The range of levels of the received signal is namely rather wide since the distance between the interrogator and any one of the transponders may be quite

different, actually from practically zero to the largest distance across which the communication is still possible. Therefore the receiver has a high gain to reliably receive even very low input signals. In order that no difficulties at the amplification of high input signals appear, any known method is used, which are of two kinds: either the amplified input signal is limited or the receiver gain is automatically adjusted to the input signal level.

In the known methods of the first kind the amplified input signal is limited in the amplifying stage, in which a resistor in an amplifier feed-back loop is shunted by a Zener diode; when the signal amplitude exceeds the Zener diode threshold, the gain is immediately reduced. A drawback is that the ratio of the useful signal to the noise signal at the output of the amplifier is worse than at its input.

In the known methods of the second kind the gain is set automatically, *e.g.* according to patent US 5,929,706. They are especially known in the field of telecommunications and audio systems. According to this method, when the input signal level is high, the gain of the receiving path is automatically adjusted, *i.e.* lowered, so that the received signal remains within the linear receiver operation region.

When an overly high signal is detected, an attack is activated, so a rapid gain lowering is started until an appropriate signal height is attained. At that moment or when the attack signal ceases to exist, the decay begins (MOTOROLA Analog IC Device Device Data MC 1490 p. 7). So the gain rises slowly to a high level, on which the system persists till the next attack. Said features are reflected in the preamble of claim 1. When the sine-shaped input signal is high for a fairly long time, the output amplitude is really lowered below the limit of a gain correcting activation, yet the decay again raises the output signal out of the linearity region and therefore the attack is activated once again. The system permanently switches over between the states of the attack and the decay. The attack rate must be several orders of magnitude above the decay rate, moreover, both rates must be matched to the nature and the frequency spectrum of the input signals.

after the lapse of the waiting period, which started when the instantaneous amplified signal value for the last time after the end of the attack exceeded the waiting threshold voltage level Vw.

At the arrival of the second data wave packet b the attack is activated. The attack lasts practically the whole time, while the wave packet b arrives; the output signal Uout namely exceeds the attack threshold voltage level Vatt even at the lowest settable gain. After the lapse of the waiting period following the cease of the data wave packet, the gain is reset to its highest value.

Claims

1. Method for automatically setting the gain of an interrogator receiver within a non-contacting identification system consisting of the interrogator and several transponders,
according to which method, within a receiver amplifier of the interrogator,
a gain lowering is activated each time when an amplified input signal exceeds an attack threshold voltage level (Vatt), and a gain rising is activated after the gain lowering has ended,
characterized in
that the amplifier responds with the gain rising activated after the lapse of a waiting period which started when the instantaneous value of the amplified signal for the last time after the end of the gain lowering exceeded a waiting threshold voltage level (Vw).

2. Method as recited in claim 1,
characterized in
that the rate of the gain rising is of the same order of magnitude as the rate of the gain lowering.

3. Method as recited in claim 1 or 2,
characterized in
that the length of the waiting period equals a double length of the longest time interval between the adjacent pulses in a transponder data wave packet.